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(71) Applicant: BOART INTERNATIONAL LIMITED, Boart Place Oxford Park, Sandton Transvaal (ZA)

(72) Inventor: Cooper, Roy, 488 Greenfield Road, Sandown 2196 Transvaal (ZA)
Inventor: Owen, Trevor Hugh, 4 Third Street Greymont, Johannesburg 2195 Transvaal (ZA)
Inventor: Peters, Christopher Thomas, 599 Bonanza Avenue, Helderkruin 1725 Transvaal (ZA)

(74) Representative: Skone James, Robert Edmund et al, GILL JENNINGS & EVERY 53-64 Chancery Lane, London WC2A 1HN (GB)

(54) Forming components made of hard metal.

(57) A hard metal component such as a wire drawing die is made from a first or inner layer with coarse grained tungsten carbide particles and an outer or second layer with finer grained tungsten carbide particles. Initially the layers have the same content of cobalt. The layers are pressed and then sintered. After sintering the first layer is reduced in cobalt content, but has a much higher wear resistance than a conventional component for the same purpose.

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FORMING COMPONENTS MADE OF HARD METAL

BACKGROUND OF THE INVENTION

This invention relates to components made of hard metal. A hard-metal is usually composed of grains of a hard abrasion resistant material such as a metal carbide, nitride or the like and a binder metal. The most common form of hardmetal is tungsten carbide with cobalt as the binder, but frequently tungsten carbide is mixed with other metal carbides such as titanium carbide and vanadium carbide.

The component in question could be a hard wearing surface such as the surface of a metal rolling roll or it could be used in a tool for cutting or eroding other material such as an insert or button for a rock drill, or the component could provide surface fracture resistance.

SUMMARY OF THE INVENTION

According to the invention a method of forming a hard metal component comprises forming two layers of abrasion resistant grains each mixed with a metal binder in substantially the same volumetric proportions, the grains in the first layer being substantially coarser than the grains in the second layer, pressing the layers together and sintering the thus pressed layers to produce the component, whereby the first layer after sintering has a lesser metal binder content than the second layer.

The one layer is preferably substantially thinner than the other layer, and the grains in the first layer are about twice the size of the grains in the second layer.

DESCRIPTION OF AN EMBODIMENT

A wire drawing die was made using a two stage pressing operation. Two centre mandrels of different diameters were used. The diameters are calculated to give the required layer thicknesses in the sintered product taking into account shrinkage during sintering.

Tungsten carbide mixed with cobalt to an amount of 6% by mass was used. The nominal grain size for the inner layer was 3 to 5 micrometres while that of the outerlayer was 1 to 2 micrometres.

Powder of the finer grain size was first poured into the pressing die with a large diameter mandrel at the centre. After pre-pressing at 50% of the final pressing pressure, the first mandrel was removed and replaced with the smaller diameter mandrel. Powder of the coarser

grain size was poured into the annular cavity around the mandrel. The mandrel was removed after final pressing at 150 MPa and the pressing was sintered in a vaccuum at 1400°C for 30 min.

Tests showed that the binder content in the inner, thin layer of the sintered component was reduced by about 50%. The component was ground and polished and then used for wire drawing. The normal production dies at the wire drawing operation in question normally draw between 5 to 5,5 tons of wire before the dies have to be replaced. With the die made as described above 6,5 tons of wire was drawn before the wire no longer fell within the diameter specification.

In a converse situation the layer with the finer grain size could be the thinner one. Thus an anvil of ultra high pressure apparatus could have its tip formed with a layer having a higher binder metal concentration than the body of the anvil. The layer will provide thoughness and protection against surface fracture or cracks.

The essence of the invention is that layered hardmetal products, with differing binder metal contents in the layers, can be made without spalling and cracking by having differential grain sizes but substantially the same initial binder metal content.

CLAIMS:

1.

A method of forming a hardmetal component comprising forming two layers of abrasion resistant grains each mixed with a metal binder in substantially the same volumetric proportions, the grains in the first layer being substantially coarser than the grains in the second layer, pressing the layers together and sintering the thus pressed layers to produce the component, whereby the first layer after sintering has a lesser metal binder content than the second layer.

2.

The method claimed in claim 1 in which the one layer is substantially thinner than the other layer.

3.

The method claimed in either one of the above claims in which the grains in the first layer are about twice the size of the grains in the second layer.

4.

The method claimed in any one of the above claims in which the grain size in the first layer is between 3 to 5 micrometers and the grain size in the second layer is between 1 to 2 micrometers.

5.

The method claimed in any one of the above claims in which the component is a wire drawing die and the first layer is the thinner layer and is around the die opening.

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EUROPEAN SEARCH REPORT

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Application number

EP 86 30 0605

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
X	US-A-4 359 335 (L.L. GARNER) * Claims 1,2 *	1-4	B 22 F 7/06
A	EP-A-0 054 846 (GENERAL ELECTRIC) * Claim 1 *	1-4	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

B 22 F
C 22 C
E 21 B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	24-06-1986	SCHRUERS H.J.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

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